2006 Spinach Outbreak Environmental Investigation

CCLHO
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E coli O157:H7 and Spinach

- Timeline in the investigation
  - Sept. 13, 2006
    - First notifications of cluster of *E coli* O157:H7 illnesses
  - Sept. 14, 2006
    - CDC issues health alert
    - FDA issues health warning
    - CalFERT team is dispatched to Processor X
  - Sept. 15, 2006
    - Processor X announces recall of all products containing spinach

E coli O157:H7 and Spinach

- Timeline in the investigation
  - **Sep 21, 2006**
    - 3 California counties identified in traceback as source of spinach
    - First positive *E coli* found in bagged spinach from consumer (NM) with specific lot identified, P227AO3
  - **Sep 24, 2006**
    - Second confirmed positive from product with lot code P227A01 (UT)
    - Traceback leads to 4 ranches that supplied spinach to lot P227

E coli O157:H7 and Spinach

- Timeline in the investigation
  - **Sep 26, 2006**
    - Third confirmed positive from product with lot code P227 (PA)
  - **Oct 12, 2006**
    - FDA and CDHS announce finding matching isolate to outbreak pattern from a ranch in environmental sample
  - **Mar 22, 2007**
    - FDA and CDHS issue joint report on environmental investigation

E coli O157:H7 and Spinach

- **204 confirmed cases in 26 states**
- **1 confirmed case in one Canadian province**
  - **104 hospitalizations (51%)**
  - **31 Hemolytic Uremic Syndrome (15%)**
  - **3 deaths**

USA TODAY

Thursday, October 5, 2006
***E coli* Kills Idaho Toddler; Spinach Plants Probed**

THE WALL STREET JOURNAL.

Thursday, October 12, 2006
***E coli* Strain in Tainted Spinach Is Linked to California Cattle Ranch**

The New York Times

Thursday, October 12, 2006
Source of Deadly *E coli* Is Found

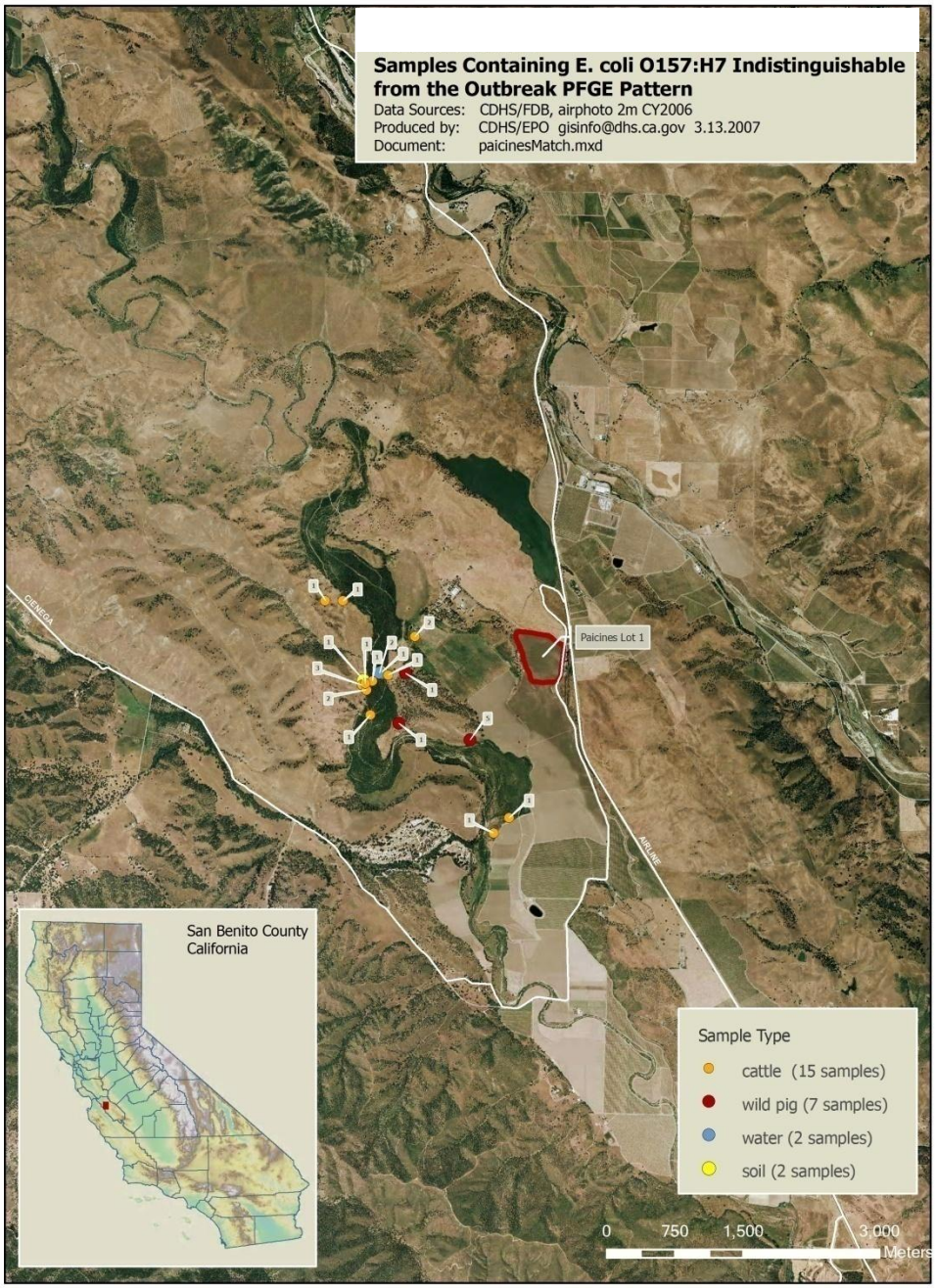
Environmental Sampling

- High volume of samples collected
- Samples:
  - Water
  - Soil/sediment
  - Cow and wild pig feces
  - Field product
  - Environmental samples from processor

Environmental Sampling/Results

- *E coli* O157:H7 found on all 4 ranches
- 28/45 (62%) *E coli* 0157:H7 isolates from one ranch matched outbreak strain
  - 4 stream water/sediment
  - 1 dust/dirt from pasture
  - 8 wild pig/wild pig feces
  - 15 cow feces
- 13/87 (15%) of wild pigs sampled on Ranch Y positive for O157

Overview of Environmnt

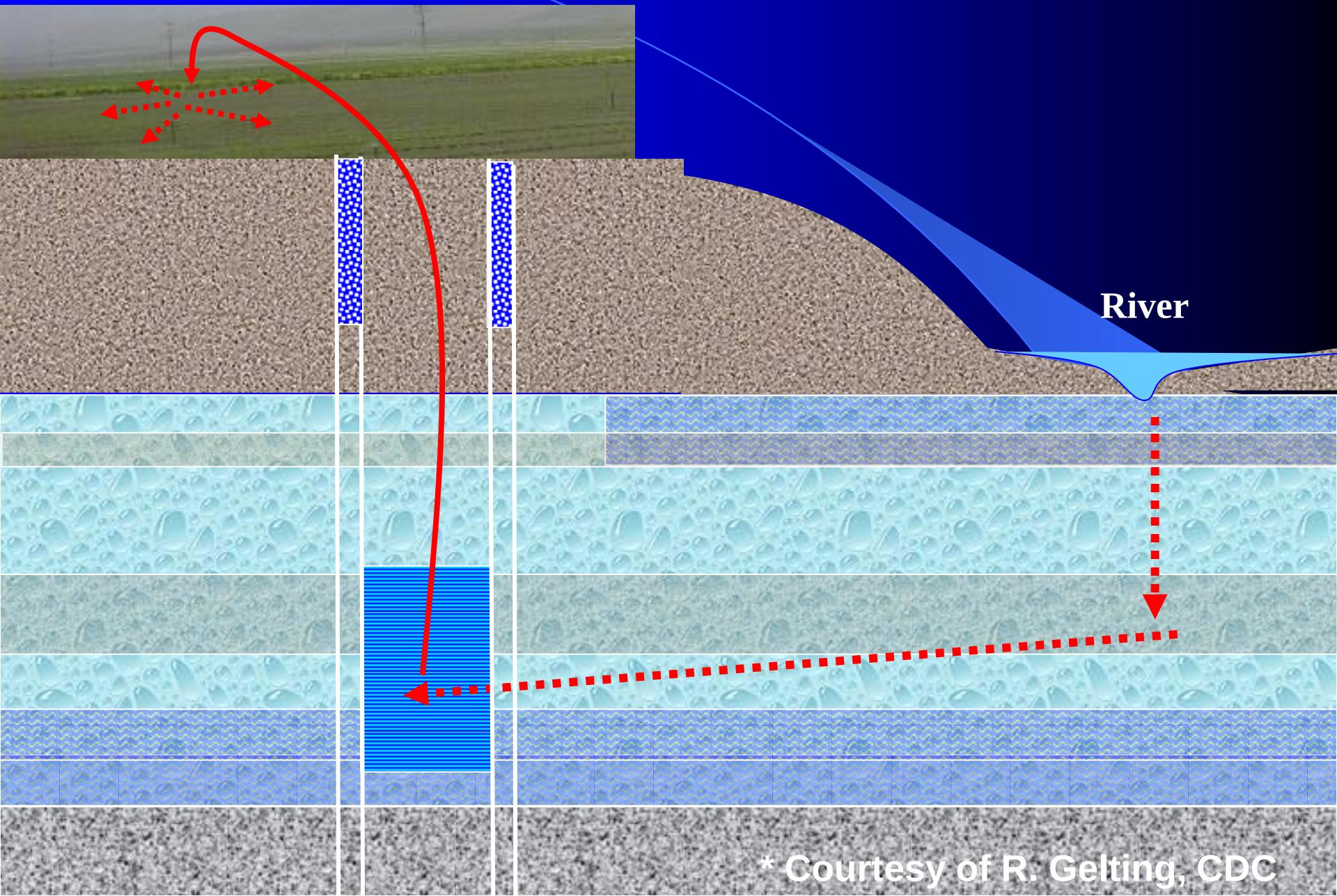


Field

E coli O157:H7 and Spinach

E coli O157:H7 and Spinach

Effect of Surface Water



* Courtesy of R. Gelting, CDC

E coli O157:H7 and Spinach "Smoking Pigs"

E coli O157:H7 and Spinach

E coli O157:H7 and Spinach

E coli O157:H7 and Spinach

Baby Spinach Harvesting

Lessons Learned

- CalFERT partnership and collaboration
  - Team approach
  - Incident Command Structure
- Laboratory collaboration
- Improved Lab Methods
- Utilize the latest in technology to communicate
  - GPS coordinates
  - Digital photos
  - High speed internet access

Conclusions

- Still do not know exactly how pathogens came into contact with spinach; much speculation based on observations at Ranch Y
  - Wild pigs
  - Surface water contamination of well water
  - Cattle
  - Dust/Airborne
- Previously identified risk factors still relevant
  - Direct fecal contamination from domestic animals and/or wildlife
  - Water (contaminated with feces)
  - Manure as fertilizer
  - Workers

Conclusions

- Estimated 4,000 cases of *E coli* O157 infection associated with one lot of bagged spinach
- Quick actions likely averted additional cases
- Large amount of resources dedicated to investigation and communication during the event
- No conclusive evidence of how contamination occurred
- This was the 20th outbreak of O157:H7 linked to leafy greens in the last 12 years
- CDFA Marketing Agreement

Findings from current and past leafy green investigations

- Pre-harvest/harvest phases of production is the most likely opportunity for introduction of contamination
- Post harvest (cooling, processing, shipping, retail) practices may contribute to spreading the contamination over thousands of bags and/or may permit growth of the organism
- Current processing practice of chlorinating/ monitoring the chlorine levels of flume water is not sufficient to control large scale contamination
- Additional barriers and better monitoring procedures are needed